

CLAIMS

What is claimed is:

1. A hearing aid, comprising:
 - an implant configured for insertion into a recess under the skin of a retro-auricular space, which implant does not occlude an ear canal, the implant comprising:
 - a case,
 - implanted electronic circuitry housed in the case;
 - a transducer electrically connected to the electronic circuitry;
 - an antenna electrically connected to the electronic circuitry; and
 - a power source electrically connected to the electronic circuitry;
 - a microphone module configured for external use, comprising:
 - a housing;
 - external electronics within the housing;
 - at least one microphone electrically connected to the electronics;
 - at least one external antenna electrically connected to the electronics; and
 - a power source electrically connected to the electronics; and
 - at least one telemetry link between the at least one external antenna and the implant antenna, allowing transmission between the microphone module and the implant;
 - wherein audio information received by the at least one microphone is processed by the external electronics, transmitted by the at least one telemetry link to the implant, and emitted by the transducer into the ear canal.
2. The hearing aid of Claim 1 wherein the transducer is located at a distal end of the case, which distal end is positioned under the skin of the ear canal.
3. The hearing aid of Claim 1 wherein the transducer is located at a distal end of the case, which distal end protrudes slightly into the ear canal.

4. The hearing aid of Claim 1 wherein the implanted power source comprises a rechargeable battery.
5. The hearing aid of Claim 1 wherein the implanted power source comprises a super capacitor.
6. The hearing aid of Claim 1 wherein the implant case comprises one piece.
7. The hearing aid of Claim 1 wherein the implant case comprises more than one piece.
8. The hearing aid of Claim 1 wherein at least one microphone of the microphone module is located remotely from the microphone module.
9. The hearing aid of Claim 1 wherein at least one external antenna of the microphone module is located remotely from the microphone module.
10. The hearing aid of Claim 1 further comprising a coating on at least part of the implant case, which coating comprises at least one material for at least one of promoting healing, resisting infection, resisting inflammation, and facilitating integration of the implant with body tissue.
11. The hearing aid of Claim 1 further comprising signal processing circuitry for processing sensed signals and presenting processed signals that are compatible with sounds traveling naturally through the ear canal.
12. The hearing aid of Claim 1 further comprising signal processing circuitry that performs voice command recognition.

13. The hearing aid of Claim 1 further including means for communicating with a commercial electronics device.

14. The hearing aid of Claim 13 wherein the means for communicating includes a telemetry communication technique.

15. The hearing aid of Claim 13 wherein the means for communicating includes a direct electrical connection.

16. The hearing aid of Claim 1 further comprising:
at least one external programming unit for customizing the hearing aid for a user; and
means for communicating with the at least one external programming unit.

17. The hearing aid of Claim 16 wherein the at least one external programming unit is a remote control.

18. The hearing aid of Claim 17 wherein the microphone module includes the remote control.

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19. A hearing aid, comprising:

an implant configured for insertion into a recess under the skin of a retro-auricular space, which implant does not occlude the ear canal, the implant comprising:

a case;

means for processing electrical signals representing sound waves into sound waves, which means are contained in the case;

means for receiving the electrical signals representing sound waves, which means are electrically connected to at least the processing means;

means for providing power to the implant, which means are electrically connected to at least the processing means; and

means for emitting the sound waves towards the ear canal, which means are connected to at least the processing means; and

a microphone module configured for external use, comprising:

a housing;

means for converting sound waves into electrical signals for transmission to the implant, which means are contained in the housing;

means for sensing the sound waves, which means are electrically connected to at least the converting means;

means for providing power to the module, which means are electrically connected to at least the converting means; and

means for transmitting the electrical signals to the implant, which means are electrically connected to at least the converting means.

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20. A hearing aid system including:

a case, having a proximal end and a distal end, configured for implantation in a patient's body with said case proximal end subcutaneously implanted proximate to a patient's retro-auricular space and said case distal end implanted proximate to said patient's ear canal;

microphone means remote from said case for generating an output signal representative of audible sound;

signal processing circuitry in said case responsive to said microphone output signal for producing an electric drive signal; and

a transducer in said case responsive to said electric drive signal for projecting an acoustic output signal into said patient's ear canal.

21. The system of claim 20 wherein said microphone means for generating said output signal comprises a housing external to said patient's body, said housing including a microphone.

22. The system of claim 21 including wireless telemetry means for coupling said microphone output signal to said signal processing circuitry.

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